

CLAIMS

1. A composite oxide having oxygen absorbing and desorbing capability comprising 90 to 100 weight % total of cerium, zirconium, and hafnium based on a total amount 5 of metals contained in the composite oxide, the total amount of cerium, zirconium, and hafnium consisting of 14.0 to 70.5 at% cerium, 29.49 to 72.5 at% zirconium, and 0.01 to 13.5 at% hafnium, wherein degree of solid solution of said composite oxide is not lower than 70 %, 10 and wherein said composite oxide has reducing property that not less than 90 % of tetravalent cerium contained in the composite oxide is reduced into trivalent cerium when the composite oxide is held at 600°C under a reducing atmosphere.

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2. The composite oxide as claimed in claim 1 further comprising a metal selected from the group consisting of titanium, tungsten, nickel, copper, iron, aluminum, silicon, beryllium, magnesium, calcium, strontium, 20 barium, a rare earth metal other than cerium, and mixtures thereof.

3. A method for preparing the composite oxide as claimed in claim 1 comprising the steps of:

(a) precipitating a composite salt from a starting material solution containing cerium ions, zirconium ions, and hafnium ions, 85 to 100 weight % of said cerium ions contained in the starting material solution being 5 tetravalent,

(b-1) subjecting said precipitated composite salt to oxidizing calcination under an oxidizing atmosphere to obtain an oxidized, calcined product, and

(b-2) subjecting said oxidized, calcined product at 10 least once to reducing calcination followed by oxidizing calcination.

4. A method for preparing the composite oxide as
claimed in claim 1 comprising the steps of:
15 (a) precipitating a composite salt from a starting
material solution containing cerium ions, zirconium ions,
and hafnium ions, 85 to 100 weight % of said cerium ions
contained in the starting material solution being
tetravalent, and
20 (b) subjecting said precipitated composite salt at least
once to reducing calcination followed by oxidizing
calcination.

5. The method as claimed in claim 3 or 4 wherein said

starting material solution further contains metal ions selected from the group consisting of titanium ions, tungsten ions, nickel ions, copper ions, iron ions, aluminum ions, silicon ions, beryllium ions, magnesium 5 ions, calcium ions, strontium ions, barium ions, ions of a rare earth metal other than cerium, and mixtures thereof.

a
6. The method as claimed in claim 3 ~~or 4~~ wherein said 10 step of precipitating a composite salt from a starting material solution is carried out by neutralizing the starting material solution with alkali.

7. The method as claimed in claim 3 wherein in the 15 reducing calcination in said step (b-2), a reducing agent is incorporated in the oxidized, calcined product prepared in said step (b-1).

8. The method as claimed in claim 7 wherein said 20 reducing calcination followed by oxidizing calcination in said step (b-2) ^{is} carried out in air.

b
9. The method as claimed in claim 4 wherein said precipitated composite salt contains a reducing agent.

10. The method as claimed in claim 9 wherein said reducing calcination followed by oxidizing calcination ^(all) is carried out in air.

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11. The method as claimed in any one of claims 7 to 10 wherein said reducing agent is selected from the group consisting of activated carbon, graphite powders, charcoal powders, ash powders, oil, paraffin, tar, pitch, and mixtures thereof.

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